14 Wall Street, Suite 1702
New York, New York 10005
tel: 212-785-9123
fax: 212-227-1692
cdmsmith.com

October 25, 2012

United States Army Corps of Engineers
Kansas City District
601 East 12th Street, Room 463
Kansas City, Missouri 64106-2896

ATTN:	CENWK-PM-ES/Buckrucker
CONTRACT:	W912DQ-11-D-3004
PROJECT:	Lower Passaic River Restoration Project Remedial Investigation/Feasibility Study Oversight (RI/FS) Lower Passaic River Study Area, New Jersey
SUBJECT:	Quality Assurance Project Plan, Addendum #12 Collection of Background Surface Sediments Samples

Dear Ms. Vaughn:

CDM Federal Programs Corporation (CDM Smith) is pleased to submit this electronic copy of the Quality Assurance Project Plan, Addendum No. 12 for Oversight of the Remedial Investigation/ Feasibility Study, Collection of Background Surface Sediment Samples in support of the Lower Passaic River Restoration Project in the Lower Passaic River Study Area, New Jersey. This document is based on the CPG's *Quality Assurance Project Plan Lower Passaic River Restoration Project RI Background and Reference Conditions Addendum, Surface Sediment Chemical analysis and Benthic Invertebrate Toxicity and Bioaccumulation Testing.*

If you have any comments concerning this submittal, please contact me at (703) 814-7325.

Very truly yours,
CDM FEDERAL PROGRAMS CORPORATION

Frank Tsang, P.E.
Project Manager

Attachment
cc: S. Vaughn, EPA
B. Sy, EPA
J. Czapor, CDM Smith (Letter Only)
S. Kirchner, CDM Smith
S. Budney, CHMM, CDM Smith
J. Oxford, CHMM, CDM smith
G. Molnar, CDM smith
Project File

623562

Contract No.: W912DQ-11-D-3004
Task Order No. 005

US Army Corps of Engineers
Kansas City District

Quality Assurance Project Plan, Addendum #12 Collection of Background Surface Sediment Samples

Lower Passaic River Restoration Project

Remedial Investigation/Feasibility Study Oversight (RI/FS)

Lower Passaic River Study Area
New Jersey

October 25, 2012

CDM Smith

LOWER PASSAIC RIVER RESTORATION PROJECT
OPERABLE UNIT (OU) 2

Remedial Investigation/Feasibility Study Oversight Quality Assurance Project Plan Addendum #12 Collection of Background Surface Sediment Samples During Fall 2012

Lower Passaic River Study Area, New Jersey

USACE CONTRACT No. W912DQ-11-D-3004

TASK ORDER No. 005

October 25, 2012

Prepared for:
U.S. Army Corps of Engineers
Kansas City District

Prepared by:
CDM Smith
Raritan Plaza 1, 6th Floor
Raritan Center
Edison, New Jersey 08837

14 Wall Street, Suite 1702
New York, New York 10005
tel: 212-785-9123
fax: 212-227-1692
cdmsmith.com

October 25, 2012

United States Army Corps of Engineers
Kansas City District
601 East 12th Street, Room 463
Kansas City, Missouri 64106-2896

ATTN:	CENWK-PM-ES/Buckrucker
CONTRACT:	W912DQ-11-D-3004
PROJECT:	Lower Passaic River Restoration Project Remedial Investigation/Feasibility Study Oversight (RI/FS) Lower Passaic River Study Area, New Jersey
SUBJECT:	Quality Assurance Project Plan, Addendum #12 Collection of Background Surface Sediment Samples

Dear Ms. Vaughn:

CDM Federal Programs Corporation (CDM Smith) is pleased to submit this electronic copy of the Quality Assurance Project Plan, Addendum No. 12 for Oversight of the Remedial Investigation/ Feasibility Study, Collection of Background Surface Sediment Samples in support of the Lower Passaic River Restoration Project in the Lower Passaic River Study Area, New Jersey. This document is based on the CPG's *Quality Assurance Project Plan Lower Passaic River Restoration Project RI Background and Reference Conditions Addendum, Surface Sediment Chemical analysis and Benthic Invertebrate Toxicity and Bioaccumulation Testing.*

If you have any comments concerning this submittal, please contact me at (703) 814-7325.

Very truly yours,
CDM FEDERAL PROGRAMS CORPORATION

Frank Tsang, P.E.
Project Manager

Attachment
cc: S. Vaughn, EPA
B. Sy, EPA
J. Czapor, CDM Smith (Letter Only)
S. Kirchner, CDM Smith
S. Budney, CHMM, CDM Smith
J. Oxford, CHMM, CDM smith
G. Molnar, CDM smith
Project File

TABLE OF CONTENTS

Note: Worksheets not included herein are included in the Physical Water Column Monitoring/Generic Final QAPP dated March 9, 2010.

Acronyms

%	percent
%D	percent difference
%R	percent recovery
µg/kg	microgram per kilogram
A	analytical
ANSETS	Analytical Services Tracking System
ASC	analytical services coordinator
ASTM	American Society of Testing and Materials
BERA	baseline ecological risk assessment
CCV	continuing calibration verification
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
COC	chain of custody
CPG	Cooperating Parties Group
CRQL	contract required quantitation limits
DESA	Division of Environmental Science and Assessment
DQI	data quality indicators
DQL	data quality level
DQO	data quality objectives
EPA	United States Environmental Protection Agency
ERA	ecological risk assessment
FASTAC	Field and Analytical Services Teaming Advisory Committee
FS	feasibility study
g	gram
GC/MS	gas chromatograph / mass spectroscopy
HASP	Health and Safety Plan
HDPE	high density polyethylene
HPLC	High Pressure Liquid Chromatography
HRGC/HRMS	High Resolution Gas Chromatography / High Resolution Mass Spectrometry
HRGC/LRMS	High Resolution Gas Chromatography / Low Resolution Mass Spectrometry
LC	lethal concentration
LPR	Lower Passaic River
Ltd.	limited
MDL	method detection limit
mg/kg	milligram per kilogram
mg/L	milligram per liter

MPC	measurement performance criteria
MS	matrix spike
MS/ MSD	matrix spike /matrix spike duplicate
NA	not available or not applicable
NJ	New Jersey
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NOAA	National Oceanic Atmospheric Administration
^{o}C	degrees Celsius
oz	ounce
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PAL	project action limit
PCB	polychlorinated biphenyl
PCDD/PCDF	polychlorodibenzodioxin/polychlorodibenzofurans
PM	project manager
PPE	personal protective equipment
ppt	parts per thousand (salinity unit)
PQL	project quantitation limit
PQLG	project quantitation limit goal
QA	quality assurance
QAC	quality assurance coordinator
QAPP	quality assurance project plan
QC	quality control
QL	quantitation limit
QP	quality procedure
RA	remedial action
RI/FS	Remedial Investigation / Feasibility Study
RPD	relative percent difference
RPM	remedial project manager
RRF	relative response factor
RSCC	Regional Sample Control Coordinator
RSD	relative standard deviation
S&A	sampling and analytical
SOP	standard operating procedure
SOW	scope of work
SVOC	semi-volatile organic compound
TBD	to be determined
TOC	total organic carbon

TSOP	Technical Standard Operating Procedure
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound
WS	worksheet

Introduction

CDM Federal Programs Corporation (CDM Smith) will perform oversight and accept split background sediment and toxicity samples from the Cooperating Parties Group (CPG) during the Fall 2012.

This Quality Assurance Project Plan (QAPP) Addendum (No. 12) and the *Lower Passaic River RI/FS Oversight Final QAPP, Physical Water Column Monitoring and Generic Information for Upcoming Tasks*, dated March 2010 (hereafter referred to as the Final QAPP) is the governing document for execution of this oversight. CDM Smith will use the various plans prepared by the CPG contractors to verify proper execution of the background surface sediment sampling during the Fall 2012, conducted as part of the Remedial Investigation/Feasibility Study (RI/FS).

The March 2010 Final QAPP indicated that future oversight tasks assigned to CDM Smith would be appended with selected worksheets. The following worksheets are included in this addendum to reflect the CPG QAPPs, *Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing* (Windward 2012):

- Worksheet No. 1 contains the title and approval pages for the addendum
- Worksheet No. 2 contains the QAPP identifying information
- Worksheet No. 3 provides the distribution list
- Worksheet No. 10 describes the specific problem definition
- Worksheet No. 11 provides the project quality objectives
- Worksheet No. 14 provides a summary of project tasks
- Worksheet No. 16 provides the schedule and timeline
- Worksheet No. 18 provides the proposed survey locations
- Worksheet No. 37 provides the usability assessment (field summary report)

Worksheets 12, 15, 19, 20, 23, 24, 28, 30, and 36 are also included in this addendum to address the sampling and analytical requirements of this event. The CPG's Benthic QAPP Addendum No. 5 and the CPG's original Benthic QAPP provide procedures for conducting the sediment sampling.

1.1 Summary of Background Surface Sediment Samples Collection

CDM Smith's oversight program is designed to provide technical review, verify the accuracy of the CPG's sediment and toxicity sample results and evaluate the CPG-implemented QAPPs for sediment and toxicity sampling.

Oversight will include field observation and acceptance of split sediment samples from background areas, as part of the triad approach, and acceptance of toxicity sample. Split samples will be analyzed for select contaminants as requested by United States Environmental Protection Agency (EPA) and United States Army Corps of Engineers (USACE) and include: polychlorinated biphenyl (PCB) congeners, polychlorinated dibenzo-dioxin and furans (PCDD/PCDF) congeners, polyaromatic hydrocarbon (PAH) compounds, organochlorine pesticides, semi-volatile organic compounds (SVOC), metals (including mercury and methylmercury), and physical parameters [percent moisture and total organic carbon (TOC)]. Select samples will also be submitted for toxicity evaluations. Additional oversight activities will include review of CPG supporting documents and verification of sample locations.

This oversight QAPP details the planning and execution processes for conducting field oversight; and accepting, preparing and shipping samples for analysis.

QAPP Worksheet #1
Title and Approval Page

Document Title: **LPR Restoration Project Final Quality Assurance Project Plan (QAPP) Addendum No. 12, Collection of Background Surface Sediment Samples**

Lead Organization: United States Army Corps of Engineers (USACE) – Northwestern Division

Preparer's Name and Organizational Affiliation: Vanessa Macwan, CDM Smith

Preparer's Address, Telephone Number, and E-mail Address: 110 Fieldcrest Avenue, #8, 6th Floor, Edison, NJ, 08837; (732) 590-4706; MacwanVC@CDMSmith.com

Preparation Date (Day/Month/Year): October 25, 2012

Investigative Organization's Project Manager/Date: for

Signature 10/25/12

Frank Tsang/CDM Smith

Investigative Organization's Project QA Manager/Date: SOR

Signature 10/25/2012

Jo Nell Mullins/CDM Smith

Lead Organization's Project Manager/Date:

Signature

Elizabeth Buckrucker/USACE – KC District

EPA Remedial Project Manager /Date:

Signature

Stephanie Vaughn

EPA Quality Assurance Officer /Date:

Signature

William Sy

Document Control Numbering System: Not Applicable (N/A)

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project Name: Lower Passaic River (LPR) Restoration Project	**Title**: QAPP Addendum No. 12, Collection of Background Surface Sediment Samples
Site Location: LPR study area, New Jersey	**Revision Number:** 0
Site Number/Code: NJD 980528996	**Revision Date:** NA
Operable Unit (OU): OU2	**Contractor Name:** CDM Federal Programs Corporation (CDM Smith)
Contractor Number: W912DQ-08-D-0018	
Contract Title: Unrestricted Indefinite Delivery/Indefinite Quantity, Multiple Award Contract, for Achitect-Engineer Environmental Services for EPA Region 2 and the Corps of Engineers Northwestern Division.	
Task Order Number: 14	

1. Regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Superfund)
2. Approval entity: United States Army Corps of Engineers (USACE)
3. The QAPP is (select one): Generic **√ Project Specific**
4. Dates of negotiation: NA
5. Dates and titles of QAPP documents written for previous and current site work, if applicable:

Title	Approval Date
See Final QAPP for a full list of previous QAPP prepared for site work	
Lower Passaic River RI/FS Oversight Final QAPP, Physical Water Column Monitoring and Generic Information for Upcoming Tasks (PWCM/Generic QAPP) (referred to herein as Final QAPP)	March 2010
LPR RI/FS Oversight QAPP, Final Addendum No.1: *Avian Community Survey*	August 6, 2010
LPR RI/FS Oversight QAPP, Final Addendum No.2: *Fish Community Survey*	June 8, 2010
LPR RI/FS Oversight QAPP, Final Addendum No.3: *Benthic Invertebrate Community Survey*	June 8, 2010
LPR RI/FS Oversight QAPP, Addendum No.4: *Surface Sediment Sampling Co-located with the Small Forage Fish Tissue Samples during the Summer 2010 Benthic Community Survey oversight*	July 12, 2010
LPR RI/FS Oversight QAPP, Addendum No.5: *Fish Tissue Analysis*	August 24, 2010
LPR RI/FS Oversight QAPP, Addendum No.6: *Habitat Identification Survey*	August 9, 2010
LPR RI/FS Oversight QAPP, Addendum No.7: *Caged Bivalve Study*	April 29, 2011
LPR RI/FS Oversight QAPP, Addendum No.8: *Small Volume Chemical Water Column Monitoring Study*	August 2, 2011
LPR RI/FS Oversight QAPP, Addendum No.9: *River Mile 10.9 Characterization*	August 25, 2011
LPR RI/FS Oversight QAPP, Addendum No.10: *Low Resolution Coring Supplemental Sampling Program*	January 6, 2012
LPR RI/FS Oversight QAPP, Addendum No.11: *High Volume Chemical Water Column Monitoring Study*	August 28, 2012

6. Organizational partners (stakeholders) and connection with lead organization: United States Environmental Protection Agency (EPA), USACE, New Jersey Department of Environmental Protection (NJDEP), New Jersey Department of Transportation (NJDOT), National Oceanic Atmospheric Administration (NOAA), United States Fish and Wildlife Service (USFWS)

7. Data users: EPA, USACE, Partner Agencies, CDM Smith, Louis Berger Group, Inc., HydroQual, Inc., and Stakeholders

8. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusions below: the Final Generic QAPP provides all the required worksheets. *This addendum addresses only the Collection of Background Surface Sediment and Toxicity Samples during the Fall 2012, therefore only worksheets pertinent to this task and information not previously provided are included.*

This is an oversight project; therefore, the CPG's contractors will be performing health and safety monitoring, and will be responsible for equipment calibration, inspection and maintenance (survey instruments). CDM Smith will monitor the field activities and document observations.

QAPP Worksheet #3
Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address
Stephanie Vaughn	Remedial Project Manager (RPM)	EPA	(212) 637-4427	(212) 637-4393	vaughn.stephanie@epamail.epa.gov
Elizabeth Buckrucker	Project Manager (PM)	USACE	(816) 389-3581		elizabeth.a.buckrucker@usace.army.mil
William Sy	Quality Assurance (QA) Officer	EPA	(732) 321-6648	(732) 321-6622	sy.william@epa.gov
Janine MacGregor	Partner Agency	NJDEP	(609) 633-0784		janine.macgregor@dep.state.nj.us
Elkins Green	Partner Agency	NJDOT	(609) 530-8075		elkins.green@dot.state.nj.us
Tim Kubiak	Partner Agency	USFWS	(609) 646-9310		tim_kubiak@fws.gov
Reyhan Mehran	Partner Agency	NOAA	(212) 637-3257		reyhan.mehran@noaa.gov
Jeanne Litwin	Program Manager	CDM Smith	(212) 377-4524	(212) 785-6114	LitwinJ@cdmsmith.com
Frank Tsang	Project Manager	CDM Smith	(212) 377-4056	(212) 785-6114	TsangC@cdmsmith.com
Sharon Budney	Deputy Project Manager	CDM Smith	(732) 590-4662	(732) 225-7851	BudneySL@cdmsmith.com
Jeniffer Oxford or other assigned quality assurance coordinator (QAC)	Regional QA Coordinator (QAC) / Project QA Officer	CDM Smith	(212) 377-4536	(212) 785-6114	OxfordJM@cdmsmith.com
George Molnar	Field Task Leader	CDM Smith	(732) 590-4633	(732) 225-7851	MolnarGC@cdmsmith.com
Scott Kirchner	Analytical Services Coordinator (ASC)	CDM Smith	(732)590-4677	(732) 225-7851	KirchnerSF@cdmsmith.com
James Fitzpatrick	Sediment Transport Modeler	HydroQual	(201) 529-5151	(201) 529-5728	jfitzpatrick@hydroqual.com
Candice Navaroli	Laboratory Manager	Axys Analytical Services limited (Ltd.)	(250) 655-5800 or (888) 373-0881	To be determined (TBD)	cnavaroli@axys.com
John Birri	Laboratory Contact	DESA Laboratory	219-769-8378	(732) 906-6886	Birri.John@epamail.epa.gov

QAPP Worksheet #10
Problem Definition

The problem to be addressed by the project:

Background surface sediment sampling: Oversight will include field observation and collection of sediment split samples as part of the triad approach.

The environmental questions being asked:

- Does the Cooperating Parties Group (CPG) data adequately describe the site conditions and is it representative for project decisions?
- Is the CPG and CDM Smith data complete and accurate?
- Are the data sets comparable?
- Are the CPG versus CDM Smith data relative percent difference (RPD)'s within the measurement performance criteria?

Secondary data: See Worksheet #13 of the CPG Benthic QAPP (Windward 2012)

The possible classes of contaminants and the affected matrices:

Split sediment samples will be collected for the following chemical analyses:

- polychlorinated biphenyls (PCB) congeners
- polychlorodibenzodioxin/polychlorodibenzofurans (PCDD/PCDF) congeners
- organochlorine pesticides
- polycyclic aromatic hydrocarbons (PAHs), alkylated PAHs, and semi-volatile organic compounds (SVOCs)
- metals including inorganic total mercury
- methylmercury
- percent moisture
- total organic carbon (TOC)

Split samples will not be accepted for the following analytes which will be analyzed by the CPG contractors: volatile organic compounds (VOCs), PCB Aroclors, herbicides, total petroleum hydrocarbons, butyltins, sulfide, total phosphorus, total Kjeldahl nitrogen, cyanide, ammonia, acid volatile sulfide/simultaneously extracted metals, and grain size.

Sediment split samples will also be submitted for laboratory toxicity tests using the amphipod *Hyalella azteca* and the midge *Chironomus dilutus*. CDM Smith will follow the Malcolm Pirnie QAPP (Malcolm Pirnie 2009) methods to try and match the pervious toxicity sampling event.

QAPP Worksheet #10
Problem Definition

The rationale for inclusion of chemical and non-chemical analyses:

The split samples will be used to support the goals of the oversight program. The analyses selected to be split were determined to be more critical for oversight evaluation; the analyses that will not be split are ancillary parameters and not major risk drivers. VOCs were identified as contaminants of potential ecological concern in sediment but are not bioaccumulative and herbicides have low bioaccumulation potential. The field observations and split sample data will enable CDM Smith to perform technical review and evaluation on the CPG field program, analytical data and reports and to qualitatively assess any potential bias in the CPG dataset.

Project decision conditions ("If..., then..." statements):

- If field work is inconsistent with the CPG QAPPs, then the field oversight staff will verify tasks with respect to the CPG's QAPPs, and Health and Safety Plan (HASP) and note deviations with the CPG's field project leader and document such discussions in the Daily Field Summary Reports submitted to EPA. The CDM Smith Project Manager, USACE PM and EPA RPM will be informed if there are deviations.
- If the CPG team needs to relocate survey locations, or there are any changes to the planned field program, CDM Smith will communicate this change to the USACE and document it on the Daily Field Summary Reports.

CDM Smith will present the data findings in a report and submit it to the USACE and EPA who will then determine if any additional actions are required.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

Who Will Use the Data? USACE, EPA and other partner agencies, CDM Smith, and stakeholders (as necessary).

What Will the Data be Used For?

The CPG will use the sediment data to support the ecological risk assessment (ERA) and develop biota-sediment accumulation factors. Oversight activities will monitor the CPG-implemented surface sediment sampling program to verify that elements of the approved RI/FS QAPPs are fulfilled. The oversight field crew will also review the CPG-selected sampling locations. CDM Smith's split sample results will be compared to the data obtained by the CPG to determine if a bias exists in the data produced by the CPG and if the data is complete and accurate and compliant with the approved QAPPs. The LPRSA is the subject of a remedial investigation/feasibility study (RI/FS), which includes the performance of an HHRA and a baseline ecological risk assessment (BERA). The background sediment results will be used to distinguish potential impacts from regional background inputs to the LPR.

A comparison of the split sample data and the CPG parent sample data will only be completed for parameters that were analyzed and detected by both the CPG program and the oversight program. Data comparison will not be conducted on concentrations that are considered non-detect by either the CPG validators or oversight validators. (Note that if a consistent bias in detections is observed in either the split samples or CPG samples, an evaluation of detection limits will be completed.) The data comparison will be presented in a table showing the relative percent difference for values that are 5 times the quantitation limits. As appropriate, alternative data comparisons will be provided. For each location, a mean and variance of the sample concentrations may also be calculated. These statistics will be compared to the CPG samples. For analytical groups that contain multiple parameters (e.g., congeners), the data comparison will be completed on select parameters per chemical class.

Because of the overlap of the SVOC and PAH chemical classes, some analytes will be reported twice in the split sample program. For the data comparison, PAH results reported by Axys Analytical Services using the High Resolution Gas Chromatography/Low Resolution Mass Spectrometry (HRGC/LRMS) method will take precedence over the PAH data generated by Shealy during the SVOC analysis.

CDM Smith's QC data will be used to determine CDM Smith's split samples data quality and comparability with the CPG's data and whether sample results are acceptable based on the established project data quality objectives (DQOs). QC sample results will be compared to the measurement performance criteria (MPC) of the data quality indicators (DQIs).

To further achieve these objectives, CDM Smith field personnel will observe the CPG's contractors field implementation of the RI/FS QAPPs and note any deviations. Deviations will be brought to the attention of the CPG's contractor, and reported to the CDM Smith PM who will communicate this information to the USACE PM and EPA RPM. These will be documented in the Daily Field Summaries and in the Final Report and will include a discussion of the impact of the deviation(s) on the data quality. The CPG contractor's activities will be documented in the field logbook and oversight forms. A copy of the oversight form is provided in Appendix B of CDM Smith's Final QAPP.

What Type of Data is Needed?

CDM Smith will observe and document the background surface sediment sampling activities conducted by the CPG's contractor to facilitate verification of the chemical data suitability for the ecological risk assessment. Split samples will be collected at random locations selected by the CDM Smith field team or as directed by the CDM Smith Deputy PM or the USACE/EPA project managers. Chemical and physical data, PCB congeners, PCDD/PCDF congeners, organochlorine pesticides, PAHs, alkylated PAHs, and SVOCs, metals including inorganic total mercury, methylmercury, such as percent moisture and TOC will be determined from the split samples accepted from the CPG. Low limits are

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

required for mercury and methylmercury as shown on QAPP Worksheet # 15.

Laboratory Toxicity Testing: At select locations, CDM Smith oversight staff will request the CPG field team to collect additional sediment mass for laboratory toxicity tests; a 28-day survival and growth using *H.azteca* and 10-day survival and growth using *C. dilutus*. The government-assigned laboratory will follow their laboratory SOP to conduct both tests, but may modify their procedure so that test conditions are comparable to the CPG-assigned laboratory SOP. CDM Smith oversight staff will coordinate with the CPG-assigned laboratory to verify test conditions, as necessary. Refer to Worksheet 19 on sampling mass requirements and Worksheet 23 on details for toxicity test SOP modifications. (Site-specific reference sediment will not be collected from the Lower Passaic River.)

How much data are needed?

Oversight observations will be made at the locations shown on Figure 1 of the CPG's Benthic QAPP Addendum No. 5, Collection of Background Surface Sediment Samples. CDM Smith will observe the CPG's Contractor sampling at all locations and will accept split samples at approximately 10 percent of the sampling locations. Worksheets # 11 and 18 of the CPG's Benthic QAPP Addendum No. 5, Benthic QAPP Addendum No. 2, and Figure 1 show the planned locations for sampling.

How "good" do the data need to be in order to support the environmental decision?

The oversight observation will mirror the CPG locations to allow data comparability. CDM Smith's oversight staff will document whether the sampling program is consistent with the CPG's Benthic QAPPs. The representativeness of the data is dependent on the sampling design.

Definitive level data are required for full validation of the data. The laboratory reporting limits or quantitation limits (QLs), need to be below or equal to the CPG's project required detection limits or the CPG's achievable laboratory quantitation limits. CDM Smith will notify DESA or the CDM Smith subcontract laboratory and request lower reporting limits to achieve the project data quality objectives for sensitivity as needed. CDM Smith has attempted to use comparable methods and obtain similar reporting limits to the CPG's.

Validation of data will be performed by Division of Environmental Science and Assessment (DESA)/ EPA; however samples analyzed by a subcontract laboratory will be validated by CDM Smith.

In addition, to ensure that measurement performance criteria for usability (criteria for measures of precision, accuracy, representativeness, comparability, completeness, and sensitivity) are met, all CDM Smith data will be subject to a data usability assessment. The inputs will be the EPA-generated validation reports and subcontract laboratory quality control (QC) summaries. Measurement performance criteria for the assessment are presented in Worksheets #35 and 36, see Addendum 10 for Worksheets #12 and 28. The results will be presented in a CDM Smith data report.

The data usability assessment will evaluate whether appropriate field procedures were followed and whether data met the approved QAPP and project DQOs and are usable for the stated project needs.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

Where, when, and how should the data be collected?

When - The background surface sediment and toxicity test samples will be collected by the CPG's contractor and split with the CDM Smith oversight staff during the fall 2012. Oversight will be performed according to the CPG's schedule. The exact sample date is yet to be determined.

Where - The sample locations are shown in the CPG's Benthic QAPP Addendum No. 5, Figure 1. At locations selected by CDM Smith in consultation with the USACE and EPA, additional sediment mass will be collected to generate sufficient mass for both CPG and CDM Smith sample sets.

How - Field sampling procedures are described in the CPG's Benthic QAPP (Worksheet # 11) and the Benthic QAPP Addendum No. 5 which details the sampling procedures which describe how the samples will be collected. CDM Smith will accept the split samples and prepare them for shipment.

Who will collect and generate the data?

CDM Smith oversight staff will record field observations and accept splits of the selected locations while the field sampling program is being conducted by the CPG. The analytical laboratories outlined in this QAPP will generate the data.

How will the data be reported?

- Field observations will be recorded as described in CDM Smith's Final QAPP using field oversight forms provided in Appendix B therein. Oversight staff will also record notes in field logbooks in accordance with technical standard operating procedure (TSOP) 4-1 provided in Appendix C of the CDM Smith Final QAPP.
- Results will be reported in text format and will include a discussion of the data quality, deviations from the QAPP, and oversight data comparability with the CPG's data. This review will be used to evaluate the accuracy of the CPG data.
- Sample results generated by the DESA or EPA CLP laboratory will be e-mailed to CDM Smith for use in the data assessment and evaluation.
- Sample results generated by CDM Smith's subcontract laboratory will be e-mailed to CDM Smith for review and validation.
- Data reporting is further covered in the CDM Smith Final QAPP.

How will the data be archived?

- Hard copies of data will be kept in the Edison office until archived in the project file. If requested, survey data will be uploaded to a PREmis or equivalent database.

The CDM Smith March 2010 Final QAPP contains other archival information.

QAPP Worksheet #12-a
Measurement Performance Criteria Table

Matrix	Sediment
Analytical Group	Toxicity Test (*Chironomus dilutus)*
Concentration Level	Low

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria[1] (MPC)	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
CPG Group's SOP, and QAPP CDM Smith will accept split	ASTM 2005; USEPA 2000. Laboratory SOP: GENSED001.1 modified for test conditions outlined in CPG laboratory SOP QA-1407	Health of test organisms	Survival: ≥ 70 percent (%) Average ash free dry weight: ≥ 0.48 mg per surviving individual	Laboratory negative control	A
		Health of test organisms	The LC50[2] for a positive control test should be within the mean LC50 ±2 standard deviations of the control chart.	Laboratory positive control (Reference toxicant)	A
		Acceptability of test conditions	Test conditions: Dissolved oxygen: ≥ 2.5 mg/L Temperature (daily mean): 23ºC±1ºC Temperature (instantaneous): 23ºC±3ºC Alkalinity, Hardness, and Ammonia: Should not vary by more than 50% during the test	Monitor overlying water: dissolved oxygen, pH, conductivity, and temperature daily in one surrogate test vessel for each treatment. Monitor temperature hourly in separate test vessel. Analyze alkalinity, hardness, and ammonia in one replicate of each treatment at test start and in each test vessel at test termination.	A

Note:

1. The assigned laboratory will perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable laboratory SOP.
2. LC50 (or Lethal Concentration 50) is the concentration of a chemical that kills 50 percent of a sample population.

QAPP Worksheet #12-b
Measurement Performance Criteria Table

Matrix	Sediment
Analytical Group	Toxicity Test (*Hyalella azteca)*
Concentration Level	Low

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria[1] (MPC)	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
CPG Group's SOP, and QAPP CDM Smith will accept split	ASTM 2009; USEPA 2000. Laboratory SOP: GENSED006.1 modified for test conditions outlined in CPG laboratory SOP QA-1467	Health of test organisms	Survival: ≥ 80%	Laboratory negative control	A
		Health of test organisms	The LC50[2] for a positive control test should be within the mean LC50 ±2 standard deviations of the control chart.	Laboratory positive control (Reference toxicant)	A
		Acceptability of test conditions	Test conditions: Dissolved oxygen: ≥ 2.5 mg/L Temperature (daily mean): 23ºC±1ºC Temperature (instantaneous): 23ºC±3ºC Alkalinity, Hardness, and Ammonia: Should not vary by more than 50% during the test	Monitor overlying water: dissolved oxygen, pH, conductivity, and temperature daily in one surrogate test vessel for each treatment. Monitor temperature hourly in separate test vessel. Analyze alkalinity, hardness, and ammonia in one replicate of each treatment at test start and in each test vessel at test termination.	A

Note:

1. The assigned laboratory will perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable laboratory SOP.
2. LC50 (or Lethal Concentration 50) is the concentration of a chemical that kills 50 percent of a sample population.

QAPP Worksheet #14
Summary of Project Tasks

Sampling Tasks:

As part of the LPR Restoration Project, the CPG is implementing a sediment field sampling program to support the RI/FS. On behalf of the USACE and EPA, CDM Smith will provide oversight and will record observations at all locations. The oversight program is designed to provide technical review and evaluation of CPG-implemented field sampling plans. Worksheet #10 discusses the oversight activities that will occur; and Worksheet #11 provides details on the data to be collected. CDM Smith's task is to observe and document the sampling conducted during the surveys.

Analysis Tasks:

Split samples will be collected during oversight of the background surface sediment sampling conducted during the fall 2012. Oversight forms (Appendix B of the CDM Smith Final QAPP) documenting field observations will be completed by CDM Smith's oversight staff.

Quality Control Tasks: Field duplicate samples will be collected as outlined on Worksheet #20. CDM Smith will observe CPG's calibration, testing and maintenance of their equipment. CDM Smith will document observations of the survey on field logs and in the field logbooks. The CDM Smith Deputy Project Manager or designee will review the logs to ensure that the required information has been documented.

Secondary Data: Since this is an oversight project, no secondary data is being used directly by CDM Smith. Data generated by the CPG field program will be used as shown on Worksheet #11 of the CPG's QAPP Addendum No. 5: Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing.

Data Management Tasks:

Analytical data generated by the various laboratories will be managed according to the procedures described in the CDM Smith Final QAPP. The information will be uploaded to the EQuIS database.

Documentation and Records: All field activity and deviations will be documented on the survey sheets and additional information in project logbooks.

The Benthic Invertebrate Community Survey procedures are documented in the CPG's Benthic QAPP and Worksheet # 11 of the CPG's Benthic QAPP Addendum No. 5: Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing. Oversight observations will be documented in the following:

1. Field logs/logbooks
2. Data Validation reports
3. Chain of Custodies (COCs), Analytical Services Tracking System (ANSETS), and Trip Report
4. Oversight summary report
5. Data Quality and Usability Summary Report

QAPP Worksheet #14
Summary of Project Tasks

All procedures will be documented in accordance with technical standard operating procedure (TSOP) 4-1 provided in Appendix C of the CDM Smith Final QAPP.

Assessment/Audit Tasks: See CDM Smith Final QAPP for assessment tasks (CDM Smith 2010)

Data Review Tasks: The CPG Data Summary Report will be reviewed by CDM Smith. A data quality evaluation will be performed based on the CPG compliance with the approved QAPP. A comparison of CDM Smith's field staff observations and surface sediment sample results with the CPG data report will be included in the data quality evaluation submitted to the USACE.

QAPP Worksheet #15-a
Reference Limits and Evaluation Table

Matrix: Sediment
Analytical Group: PAH/ Alkyl PAH by Axys standard operating procedure (SOP) MLA-021
Concentration Level: Low (microgram/kilogram (µg/kg))

Analyte	CAS Number	Project Action Limit[1]	Data Quality Levels[1]	Project Quantitation Limit Goal[2]	Analytical Method[3]			Achievable Laboratory Limits[4]	
					MDLs	SOM01.2 CRQLs	8270 QLs	MDLs	QLs
1-Methylnaphthalene	90-12-0	TBD	22,000	1.0	NA	Not Listed	Not Listed	NA	1.0
1-Methylphenanthrene	832-69-9	TBD	1,700,000	1.0	NA	Not Listed	Not Listed	0.28	1.0
2,3,5-Trimethylnaphthalene	2245-38-7	TBD	3,900	1.0	NA	Not Listed	Not Listed	0.60	1.0
2,6-Dimethylnaphthalene	581-42-0	TBD	3,900	1.0	NA	Not Listed	Not Listed	0.25	1.0
2-Methylnaphthalene	91-57-6	TBD	20.2	1.0	NA	170	660	0.29	1.0
Acenaphthene	83-32-9	TBD	6.71	1.0	NA	170	660	0.16	0.5
Acenaphthylene	208-96-8	TBD	5.87	1.0	NA	170	660	0.20	0.5
Anthracene	120-12-7	TBD	46.9	1.0	NA	170	660	0.41	0.5
Benzo[a]anthracene	56-55-3	TBD	31.7	1.0	NA	170	660	0.18	0.5
Benzo[a]pyrene	50-32-8	TBD	15.0	1.0	NA	170	660	0.14	0.5
Benzo[b]fluoranthene	205-99-2	TBD	150.0	1.0	NA	170	660	0.61	0.5
Benzo[e]pyrene	192-97-2	TBD	170,000	1.0	NA	Not Listed	Not Listed	0.17	0.5
Benzo[g,h,i]perylene	191-24-2	TBD	170.0	1.0	NA	170	660	0.21	1.0
Benzo[j]fluoranthene	205-82-3	TBD	240 (for k)	1.0	NA	Not Listed	Not Listed	0.10	0.5
Benzo[k]fluoranthene	207-08-9	TBD	240 (for k)	1.0	NA	170	660	0.10	0.5
Chrysene	218-01-9	TBD	57.1	1.0	NA	170	660	0.20	0.5
Dibenzo[a,h]anthracene	53-70-3	TBD	6.22	1.0	NA	170	660	0.23	1.0
Dibenzothiophene	135-65-0	TBD	NA	1.0	NA	Not Listed	Not Listed	0.23	1.0
Fluoranthene	206-44-0	TBD	111.0	1.0	NA	170	660	0.17	0.5
Fluorene	86-73-7	TBD	19.0	1.0	NA	170	660	0.17	0.5
Indeno[1,2,3-c,d]-pyrene	193-39-5	TBD	150.0	1.0	NA	170	660	0.17	1.0
Naphthalene	91-20-3	TBD	34.6	1.0	NA	170	660	1.55	0.5
Perylene	198-55-0	TBD	170,000	1.0	NA	Not Listed	Not listed	0.18	1.0
Phenanthrene	85-01-8	TBD	41.9	1.0	NA	170	660	0.13	0.5
Pyrene	129-00-0	TBD	53.0	1.0	NA	170	660	0.18	0.5
C2-Alkylnaphthalenes	Not Applicable (NA)	TBD	0.0346	0.001	NA	Not Listed	Not listed	NA	NA
C3-Alkylnaphthalenes	NA	TBD	0.0346	0.001	NA	Not Listed	Not listed	NA	NA
C1-Benzanthracene/chrysenes	NA	TBD	0.0317	0.001	NA	Not Listed	Not listed	NA	NA

QAPP Worksheet #15-a
Reference Limits and Evaluation Table

Matrix: Sediment
Analytical Group: PAH/ Alkyl PAH by Axys standard operating procedure (SOP) MLA-021
Concentration Level: Low (microgram/kilogram (µg/kg))

Analyte	CAS Number	Project Action Limit[1]	Data Quality Levels[1]	Project Quantitation Limit Goal[2]	Analytical Method[3]			Achievable Laboratory Limits[4]	
					MDLs	SOM01.2 CRQLs	8270 QLs	MDLs	QLs
C1-Dibenzothiophenes	NA	TBD	NA	0.001	NA	Not Listed	Not listed	NA	NA
C1-Fluorenes	NA	TBD	0.019	0.001	NA	Not Listed	Not listed	NA	NA
C1-Phenanthrene/anthracenes	NA	TBD	0.0419	0.001	NA	Not Listed	Not listed	NA	NA
C1-Pyrene/fluoranthenes	NA	TBD	0.053	0.001	NA	Not Listed	Not listed	NA	NA
C2-Benzanthracene/chrysenes	NA	TBD	0.0317	0.001	NA	Not Listed	Not listed	NA	NA
C2-Dibenzothiophenes	NA	TBD	NA	0.001	NA	Not Listed	Not listed	NA	NA
C2-Fluorenes	NA	TBD	0.019	0.001	NA	Not Listed	Not listed	NA	NA
C2-Naphthalenes	NA	TBD	0.0346	0.001	NA	Not Listed	Not listed	NA	NA
C2-Phenanthrene/anthracenes	NA	TBD	0.0419	0.001	NA	Not Listed	Not listed	NA	NA
C3-Benzanthracene/chrysenes	NA	TBD	0.0317	0.001	NA	Not Listed	Not listed	NA	NA
C3-Dibenzothiophenes	NA	TBD	NA	0.001	NA	Not Listed	Not listed	NA	NA
C3-Fluorenes	NA	TBD	0.019	0.001	NA	Not Listed	Not listed	NA	NA
C3-Naphthalenes	NA	TBD	0.0346	0.001	NA	Not Listed	Not listed	NA	NA
C3-Phenanthrene/anthracenes	NA	TBD	0.0419	0.001	NA	Not Listed	Not listed	NA	NA
C4-Benzanthracene/chrysenes	NA	TBD	0.0317	0.001	NA	Not Listed	Not listed	NA	NA
C4-Dibenzothiophenes	NA	TBD	NA	0.001	NA	Not Listed	Not listed	NA	NA
C4-Naphthalenes	NA	TBD	0.0346	0.001	NA	Not Listed	Not listed	NA	NA
C4-Phenanthrenes/anthracenes	NA	TBD	0.0419	0.001	NA	Not Listed	Not listed	NA	NA

Notes:
1. Project-specific action levels have not been developed. The listed Data Quality Levels (DQLs) are taken from the CPG RI/FS QAPP, *Final Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing*, October 2009, Revision 0.
2. The PQLGs reported are from the CPG's QAPP and are based on their laboratory's Quantitation Limits. The split sample data should be low enough for data comparison; lower limits than those listed in methods 8270 and SOM01.2 will be required. Differences in laboratory detection limits will be considered when comparing the data.
3. Specific method detection limits (MDLs) are not given in the listed methods.
4. Achievable MDLs listed are the statistically-derived MDLs and are based on the analysis of a 10 g dry weight sample size. QLs are based on the analysis of a 3 g dry sample size, as routinely required for Passaic River samples in order to reduce matrix effects. These MDLs and QLs are based on Axys Analytical Service typical sample specific detection limits. Results will be reported in dry weight. Actual QLs may be higher and are dependent on the sample moisture content and matrix effects. MDLs and QLs are limits that an individual laboratory can achieve when performing the analytical method.

QAPP Worksheet #15-b
Reference Limits and Evaluation Table

Matrix: Sediment
Analytical Group: SVOCs by EPA SW-846, 8270C/D
Concentration Level: Low (milligram per kilogram (mg/kg))

Analyte	CAS Number	Project Action Limit[1]	Project Quantitation Limit Goal[2]	Analytical Method[3]			Achievable Laboratory Limits	
				MDLs[3]	8270 CRQLs	SOM01.2 CRQLs	MDLs[4]	QLs[4]
1,1'-Biphenyl	92-52-4	262	0.4	NA	NA	0.17	0.01	0.033
2,2'-Oxybis (1-Chloropropane)	108-60-1	3.50	0.4	NA	0.66	0.17	0.011	0.033
2,4,5-Trichlorophenol[5]	95-95-4	0.003	0.4	NA	0.66	0.17	0.0093	0.033
2,4,6-Trichlorophenol[5]	88-06-2	0.006	0.4	NA	0.66	0.17	0.0098	0.033
2,4-Dichlorophenol[5]	120-83-2	0.005	0.8	NA	0.66	0.17	0.01	0.033
2,4-Dimethylphenol[5]	105-67-9	0.304	0.4	NA	0.66	0.17	0.012	0.033
2,4-Dinitrophenol[5]	51-28-5	0.00621	1.6	NA	3.3	0.33	0.11	0.17
2,4-Dinitrotoluene[5]	121-14-2	0.0144	0.4	NA	0.66	0.17	0.018	0.067
2,6-Dinitrotoluene	606-20-2	0.70	0.4	NA	0.66	0.17	0.017	0.067
2-Chloronaphthalene[5]	91-58-7	0.417	0.4	NA	0.66	0.17	0.011	0.033
2-Chlorophenol[5]	95-57-8	0.008	0.4	NA	0.66	0.17	0.0092	0.033
2-Methylnaphthalene[5]	91-57-6	0.0202	0.4	NA	0.66	0.17	0.0099	0.033
2-Methylphenol	95-48-7	310	0.4	NA	0.66	0.17	0.006	0.033
2-Nitroaniline	88-74-4	18.0	0.4	NA	3.3	0.33	0.023	0.067
2-Nitrophenol	88-75-5	1,800[e]	0.4	NA	0.66	0.17	0.018	0.067
3,3'-Dichlorobenzidine[5]	91-94-1	0.127	0.4	NA	1.3	0.17	0.036	0.17
3-Nitroaniline	99-09-2	18.0	0.4	NA	3.3	0.33	0.039	0.067
4,6-Dinitro-2-methylphenol[5]	534-52-1	0.610	1.6	NA	3.3	0.17	0.13	0.17
4-Bromophenyl-phenylether	101-55-3	NA[f]	0.4	NA	0.66	0.17	0.0098	0.033
4-Chloro-3-methylphenol	59-50-7	10,000	0.4	NA	1.3	0.17	0.0084	0.033
4-Chloroaniline	106-47-8	2.4	0.4	NA	1.3	0.17	0.0068	0.033
4-Chlorophenyl-phenyl ether	7005-72-3	NA[f]	0.4	NA	0.66	0.17	0.011	0.033
4-Methylphenol	106-44-5	31.0	0.4	NA	0.66	0.17	0.012	0.067
4-Nitroaniline	100-01-6	24.0	0.4	NA	NA	0.33	0.019	0.067
4-Nitrophenol[5]	100-02-7	0.0133	0.8	NA	3.3	0.33	0.096	0.17
Acenaphthene[5]	83-32-9	0.0067	0.4	NA	0.66	0.17	0.01	0.033
Acenaphthylene[5]	208-96-8	0.0059	0.4	NA	0.66	0.17	0.013	0.033
Acetophenone	98-86-2	2.00	0.4	NA	NA	0.17	0.018	0.033
Anthracene[5]	120-12-7	0.0469	0.4	NA	0.66	0.17	0.015	0.033
Atrazine	1912-24-9	2.10	0.4	NA	NA	0.17	0.017	0.033
Benzaldehyde	100-52-7	780	0.4	NA	NA	0.17	0.017	0.033

QAPP Worksheet #15-b
Reference Limits and Evaluation Table

Matrix: Sediment
Analytical Group: SVOCs by EPA SW-846, 8270C/D
Concentration Level: Low (milligram per kilogram (mg/kg))

Analyte	CAS Number	Project Action Limit[1]	Project Quantitation Limit Goal[2]	Analytical Method[3]			Achievable Laboratory Limits	
				MDLs[3]	8270 CRQLs	SOM01.2 CRQLs	MDLs[4]	QLs[4]
Benzo(a)anthracene[5]	56-55-3	0.0317	0.4	NA	0.66	0.17	0.011	0.033
Benzo(a)pyrene[5]	50-32-8	0.015	0.4	NA	0.66	0.17	0.024	0.033
Benzo(b)fluoranthene[5]	205-99-2	0.150	0.4	NA	0.66	0.17	0.022	0.033
Benzo(g,h,i)perylene[5]	191-24-2	0.170	0.4	NA	0.66	0.17	0.023	0.033
Benzo(k)fluoranthene[5]	207-08-9	0.240	0.4	NA	0.66	0.17	0.027	0.033
bis-(2-Chloroethoxy)methane	111-91-1	18.0	0.4	NA	0.66	0.17	0.01	0.033
bis-(2-Chloroethyl)ether[5]	111-44-4	0.190	0.4	NA	0.66	0.17	0.0092	0.033
bis(2-Ethylhexyl)phthalate [5]	117-81-7	0.182	0.4	NA	0.66	0.17	0.012	0.033
Butylbenzylphthalate [5]	85-68-7	0.063	0.4	NA	0.66	0.17	0.022	0.067
Caprolactam	105-60-2	3,100	0.4	NA	NA	0.17	0.017	0.033
Carbazole	86-74-8	24.0	0.4	NA	NA	0.17	0.014	0.033
Chrysene[5]	218-01-9	0.0571	0.4	NA	0.66	0.17	0.01	0.033
Dibenzo(a,h)-anthracene[5]	53-70-3	0.00622	0.4	NA	0.66	0.17	0.022	0.033
Dibenzofuran	132-64-9	NA	0.4	NA	0.66	0.17	0.01	0.033
Diethylphthalate [5]	84-66-2	0.006	0.4	NA	0.66	0.17	0.011	0.033
Dimethylphthalate	131-11-3	46.0	0.4	NA	0.66	0.17	0.011	0.033
Di-n-butylphthalate [5]	84-74-2	0.058	0.4	NA	NA	0.17	0.018	0.033
Di-n-octylphthalate	117-84-0	46.0	0.4	NA	0.66	0.17	0.032	0.067
Fluoranthene[5]	206-44-0	0.111	0.4	NA	0.66	0.17	0.01	0.033
Fluorene[5]	86-73-7	0.0190	0.4	NA	0.66	0.17	0.013	0.033
Hexachlorobenzene [5]	118-74-1	0.00200	0.4	NA	0.66	0.17	0.015	0.033
Hexachlorobutadiene [5]	87-68-3	0.0013	0.4	NA	0.66	0.17	0.011	0.033
Hexachloroethane [5]	67-72-1	0.073	0.4	NA	0.66	0.17	0.0089	0.033
Hexachlorocyclopentadiene[5]	77-47-4	0.0070	0.4	NA	0.66	0.17	0.024	0.17
Indeno(1,2,3-cd)-pyrene [5]	193-39-5	0.150	0.4	NA	0.66	0.17	0.03	0.033
Isophorone [5]	78-59-1	0.432	0.4	NA	0.66	0.17	0.0074	0.033
Naphthalene[5]	91-20-3	0.0346	0.4	NA	0.66	0.17	0.014	0.033
Nitrobenzene [5]	98-95-3	0.145	0.4	NA	0.66	0.17	0.0054	0.033
n-Nitroso-di-n-propylamine [5]	621-64-7	0.0690	0.4	NA	0.66	0.17	0.013	0.033
n-Nitrosodiphenylamine	86-30-6	99.0	0.4	NA	0.66	0.17	0.0086	0.033
Pentachlorophenol[5]	87-86-5	0.017	0.4	NA	3.3	0.33	0.14	0.17

QAPP Worksheet #15-b
Reference Limits and Evaluation Table

Matrix: Sediment
Analytical Group: SVOCs by EPA SW-846, 8270C/D
Concentration Level: Low (milligram per kilogram (mg/kg))

Analyte	CAS Number	Project Action Limit[1]	Project Quantitation Limit Goal[2]	Analytical Method[3]			Achievable Laboratory Limits	
				MDLs[3]	8270 CRQLs	SOM01.2 CRQLs	MDLs[4]	QLs[4]
Phenanthrene [5]	85-01-8	0.0419	0.4	NA	0.66	0.17	0.013	0.033
Phenol [5]	108-95-2	0.0491	0.4	NA	0.66	0.17	0.009	0.033
Pyrene[5]	129-00-0	0.0530	0.4	NA	0.66	0.17	0.014	0.033

1. At this time, project-specific screening levels or action levels have not been developed. The values listed are the DQLs taken from the CPG RI/FS QAPP, *Final Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing*, October 2009, Revision 0. The split sample data QLs should be low enough for data comparison. Differences in laboratory detection limits will be considered when comparing the data.

2. The project quantitation limit goals (PQLGs) reported are from the CPG's QAPP and are based on their laboratory's Quantitation Limits.

3. Specific MDLs are not given in the listed methods.

4. Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing the analytical method. Actual MDLs and QLs were obtained from the Shealy subcontract Laboratory.

5. The project action limit for highlighted analytes is below the method 8270 quantitation limit and/or the SOM01.2 as shown above. The laboratory requester should ensure that the laboratory is provided with the project action limits (PALs) and project quantitation limit goals to attempt to achieve the sensitivity requirements above and to match the CPG's laboratory limits.

Additional note:

Analytes may also be reported from the lower limits gas chromatograph/mass spectroscopy (GC/MS) method for PAH analysis; the PAH method results will take precedence over SOM01.2/SW846 Method 8270C results. The analytes 1-methylnaphthalene, 1-methylphenanthrene, 2,3,5-trimethylnaphthalene, 2,6-dimethylnaphthalene, benzo(a)pyrene, dibenzothiophene, and perylene, will be reported by the PAH method only.

QAPP Worksheet #15

Reference Limits and Evaluation Table

Refer to CDM Smith's Passaic QAPP Addendum 10 dated January 6, 2012 for additional Worksheet 15s. Worksheet 15's included in QAPP Addendum 10 are PCB congeners, PCDD/PCDF congeners, organochlorine pesticides, metals (including mercury and methylmercury), and physical parameters (percent moisture and TOC). The Worksheets 15 in this Addendum includes the addition of Alkyl PAHs and the change in laboratory for SVOCs. The PQL and the PQLG were not established for Toxicity testing.

QAPP Worksheet #16
Project Schedule Timeline Table

Activities	Organization	Anticipated Date(s) of Initiation	Anticipated Date of Completion	Deliverable	Deliverable Due Date
Prepare and submit: Oversight QAPP Addendum for Background Surface Sediment Sampling to EPA and USACE	CDM Smith	October 3, 2012	October 25, 2012	UFP-QAPP addendum	October 2012
Prepare and submit: Revised oversight QAPP Addendum for Background Surface Sediment Sampling	CDM Smith	As soon as comments are received	November 1, 2012	UFP-QAPP addendum	November 1, 2012
Oversight/ acceptance of splits and sample handling activities	CDM Smith	Fall 2012 –TBD	10 days after commencement date	Summary report of field notes including photographs	To be determined
Laboratory Analysis	EPA CLP/ DESA and/subcontract laboratories	October through December 2012	To be determined; data collection will be dependent on the CPG schedule	Data Package	To be determined; will be dependent on the CPG schedule For standard analyses, 21 days after the last sample is received; however, specialized analyses may take additional time
Validation and verification of sample data	CDM Smith	December 2012	December 2012	Validated data report	To be determined; will be dependent on CPG schedule
Oversight /Data Evaluation	CDM Smith	To be determined	To be determined	Oversight Summary Report/ Data Quality Summary Report	To be determined
Review CPG's Background Surface Sediment Sampling Data Report	CDM Smith	90 days after each event	1 month after receipt of report	Comments on Background Surface Sediment Analysis Data Report	1 month after receipt of report

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Survey Location ID	Depth	Analytical Group	Concentration Level	Estimated Number of Samples (identify field duplicates)	Sampling SOP Reference	Rationale for Sampling Location
Refer to QAPP prepared by Windward Environmental (Windward 2012) for the CPG	0-15 centimetres	Analytical group for split samples includes: PCB congeners, PCDD/PCDF, chlorinated pesticides, PAH and SVOC, metals (including mercury, and methylmercury), percent moisture, TOC, and toxicity tests	Low	All sampling locations will be observed. Approximately 10 percent of CPG samples will be split.	Attachment D of CPG Benthic QAPP (SOP-Collection and Processing of Sediment Grab Samples) of CPG QAPP (Windward 2009) and Benthic QAPP Addendum (Windward 2012).	Background sediment split samples will be collected judgmentally by the on-site oversight staff in consultation with the PM, deputy PM and USACE/EPA

Notes:

Refer to the QAPP prepared by Windward for the CPG (Worksheet # 10 and 18 and Figure 1) titled, *Benthic QAPP Addendum No. 5: Surface Sediment Chemical Analysis and Benthic Invertebrate Toxicity and Bioaccumulation Testing* (September 14, 2012) for sampling information.

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time[2] (preparation/ analysis)
Sediment	PCB Congeners	Low	CBC01.2 or EPA 1668A for HRGC/HRMS	10 gram (g) minimum	1- 4 ounce (oz) amber glass jar	Maintain in the dark at less than 4 ^{C}C from collection until receipt at the laboratory	If stored at less than -10^{o} C solid multiphase samples can be stored for up to one year. Sample extracts can be stored at less than -10 degrees Celsius for up to one year
	Pesticides	Low	EPA Method 1613B Modified (HRGC/HRMS)	Minimum mass = 50 g (combine mass for pesticides, PCDD/PCDF, and PAHs)	1-4 oz amber glass jar (ship one jar for pesticides, PCDD/PCDF, and PAHs)	Maintain in the dark at less than 4 degrees Celsius (^{C}C) from collection until receipt at the laboratory	14 days to extraction, 40 days to analysis at 4^{o} C. Pesticide samples can be stored 299 days if frozen.
	PCDD/PCDF	Low	EPA 1613B for HRGC/HRMS			Maintain in the dark at less than 4 ^{C}C from collection until receipt at the laboratory	If stored at less than -10^{o}C, solid multiphase samples can be stored up to one year. Sample extracts can be stored at less than -10^{o}C for up to one year
	PAH/ Alkyl PAH	Low	Axys SOP MLA-021			Maintain in the dark at less than 4 ^{o}C from collection until receipt at the laboratory	14 days to extraction, 40 days to analysis at 4^{o}C (For this study PAH samples can be stored 199 days if frozen.)
	Percent Moisture	Low	SM2540G Modified (Axys SOP EGN007-07)	Minimum mass = 5-10 g	1- 4 oz amber glass jar	Cool to 4 ^{C}C ± 2 ^{C}C	Analyze as soon as possible
Sediment	TCL SVOC	Low	SOM01.2 or SW846 Method 8270C	Minimum mass= 30 grams	1- 8 oz glass jar	Cool to 4 ^{C}C ± 2 ^{C}C	14 days to extraction; 40 days to analysis at 4 ^{C}C
	Metals	Low	SW846 Method 6010B/6020 or ILM05.4	Minimum mass = 2 g	1- 2 oz glass jar	Cool to 4 ^{C}C ± 2 ^{C}C	6 months
Sediment	TOC	Low	Lloyd Kahn	Minimum mass = 1 g	1- 4 oz glass jar	Cool to 4 ^{C}C ± 2 ^{C}C	14 days
Sediment	Total mercury and methyl mercury	Low	EPA 1630/1631	Minimum mass = 1 g	1- 4 oz pre-tared polyethylene bottle	Cool to 4 ^{C}C ± 2 ^{C}C and freeze as soon as possible	1 year [if aliquoted, weighed and frozen at <-15 ^{C}C]
Sediment	Toxicity *Chironomus dilutus*	Low	ASTM 2005; USEPA 2000. Laboratory SOP: GENSED001.1 modified for test conditions outlined in CPG laboratory SOP QA-1407	Two gallons unsieved[4]	One or two gallon Teflon-lined, HDPE bucket with lid	≤ 4 degrees Celsius	≤8 weeks, preferably ≤14 days

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentr-ation Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time[2] (preparation/ analysis)
Sediment	Toxicity *Hyalella azteca*	Low	ASTM 2009; USEPA 2000. Laboratory SOP: GENSED006.1 modified for test conditions outlined in CPG laboratory SOP QA-1467	Two gallons unsieved[4]	One or two gallon Teflon-lined HDPE bucket with lid	≤ 4 degrees Celsius	≤8 weeks, preferably ≤14 days

Notes:

1. CPG and CDM Smith subcontract laboratory SOPs are available upon request.
2. All holding times are from time of collection and based on calendar days.

QAPP Worksheet #20
Field Quality Control Sample Summary Table

Matrix	Analytical Group[1]	Concentration Level	Analytical and Preparation SOP Reference	No. of Split Sampling Locations[2]	No. of Field Duplicate Pairs	No. of Extra Volume Laboratory QC (e.g., MS/MSD[4]) Samples	No. of Equipment Blanks	No. of Trip. Blanks	No of PE Samples	Total No. of Samples
Sediment	PCB congeners	Low	CBC01.2 or EPA Method 1668A for HRGC/HRMS	4	1	1	0	0	0	5
Sediment	PCDD/PCDF congeners	Low	EPA Method 1613B for HRGC/HRMS Axys SOP MSU-020	4	1	1	0	0	0	5
Sediment	Chlorinated Pesticides	Low	EPA Method 1613B Modified (HRGC/HRMS) Axys SOP MLA-028	4	1	1	0	0	0	5
Sediment	PAHs/ Alkyl PAHs	Low	Axys SOP MLA-021	4	1	1	0	0	0	5
Sediment	TCL SVOCs	Low	SOM01.2 or SW846 Method 8270C	4	1	1	0	0	0	5
Sediment	TAL metals	Low	ILM05.4/SW846 Method 6010B/6020	4	1	1	0	0	0	5
Sediment	Mercury and methylmercury	Low	EPA Method 1630/1631	4	1	1	0	0	0	5
Sediment	TOC	Low	EPA Method Lloyd Kahn	4	1	1	0	0	0	5
Sediment	Percent moisture	Low	SM2540B	4	1	1	0	0	0	5
Sediment	Toxicity Testing *Chironomus dilutus*[3]	Low	ASTM 2005; USEPA 2000. Laboratory SOP: GENSED001.1 modified for test conditions outlined in CPG laboratory SOP QA-1407	3	0	0	0	0	0	3
Sediment	Toxicity Testing *Hyalella azteca*[3]	Low	ASTM 2009; USEPA 2000. Laboratory SOP: GENSED006.1 modified for test conditions outlined in CPG laboratory SOP QA-1467	3	0	0	0	0	0	3

QAPP Worksheet #20
Field Quality Control Sample Summary Table

Notes:

1. The Field and Analytical Services Teaming Advisory Committee (FASTAC) decision process is required for obtaining laboratory services. However, for this project it is critical for CDM Smith to mirror the CPG's analytical procedures in addition to maintaining similar volumes to provide comparable data and detection limits. This limits the number of laboratories and the methods which can be used. Low concentrations and flexibility are required for the Passaic project. Also, due to the difficulty of analyzing the sample matrix for the selected analyses, subcontract laboratories are being used to supplement DESA services to ensure accurate results, to reduce uncertainties in the measurements and to obtain data comparable with data from previous and future surveys and with the CPG's data. PAH/ alkyl PAH, organochlorinated pesticides, PCB congeners, and dioxin/furans will be analyzed by Axys laboratory. CDM Smith subcontracted one of its master services agreement laboratories, Shealy, to obtain analytical services for the metals; TPH extractables, and low level mercury will be analyzed by Test America and Microbac laboratory, respectively. DESA has been requested to perform the TOC analysis.
2. 10% Splits, exact numbers to be determined. The exact number of samples to be split will be determined in the field and is based on the CPG sediment sampling during the fall 2012 effort.
3. The split sample program will also include sediment split samples for toxicity tests. Tests conducted will consist of a 28-day survival and growth using *H. azteca, and* 10-day survival and growth using *C. dilutus*.
4. MS/MSD – matrix spike/matrix spike duplicate. Note that the MS/MSD is not considered an extra sample. Additional volume may be required.

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
CBC01.2 or EPA Method 1668A for HRGC/HRMS	*Analysis of PCB Congeners by EPA Method 1668A*. December 2011.	Definitive	PCB Congeners	HRGC/HRMS	Axys Analytical Services Laboratory 2045 Mills Road West Sidney, British Columbia, Canada Contact: Candice Navaroli Phone:1-888-373-0881	No
EPA 1613B for HRGC/HRMS Axys SOP: MSU-020	*Analysis of Polychlorinated Dioxins and Furans by EPA Method 1613B*. June 2012.	Definitive	PCDD/PCDF Congeners	HRGC/HRMS	Axys Analytical Services	No
EPA 1613B Modified/ Axys SOP: MLA-028	*Analysis of Organochlorine Pesticides by HRGC/HRMS in [Water, Solids, Biosolids and Tissue.* June 2012.	Definitive	Chlorinated Pesticides	HRGC/HRMS	Axys Analytical Services	Analyte list per WS#15
Axys SOP: MLA-021	*Analysis of Polycyclic Aromatic Hydrocarbons (PAHs) and Alkylated PAHs by method MLA-021*. June 2012.	Definitive	PAHs and Alkyl PAHs	HRGC/HRMS	Axys Analytical Services	No
SM2540G Modified	*Total, Fixed, and Volatile Solids in Soil and Semisolid Samples. Standard Methods for Examination of Water and Wastewater*. 19th Edition 1995.	Definitive	Moisture	Furnace, Balance, Oven	Axys Analytical Services	Yes
C-90 (SOM01.2 or 8270C) Shealy SOP: S-SV-021	*Analysis of Base /Neutral and Acid Compounds in Aqueous, Soil/ Sediment and Waste Oil/Waste Organic Solvent Samples*. *SOP GC/MS Analysis based on EPA Method 8270D, Prepared by EPA Method 3520C, 3550C and 3580A*. Rev 6, March 2011.	Definitive	SVOCs in extracts from solid and aqueous matrices	GC/MS	Shealy	No

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
C-109	*Determination of Trace Elements in Aqueous Trace Metals in Aqueous, Soil/Sediment/Sludge-ICP-AES*. Rev 2.0. March 2007.	Definitive	Metals	ICP-AES	DESA	No
ILM05.4	*CLP SOW for Multi-Media, Multi-Concentration Inorganic Analysis*. December 2006	Definitive	Metals	ICP-AES ICP-MS	CLP	No
C-112	*Trace Metals in Aqueous, Soil/ Sediment/Sludge/Waste Oil/Organic and Biological tissue by Inductively Coupled Plasma-Mass Spectrometry*. Rev 2.0. March 2007.	Definitive	Metals	ICP-MS	DESA	No
EPA 1631	*Total Mercury in Aqueous Samples by Cold Vapor Atomic Fluorescence*. August 2012.	Definitive	Total mercury	CVAFS	Microbac Laboratories, Inc. 250 W. 84th Drive Merrillville, IN 46410 Contact Person: Kevin Falvey Phone: 219-769-8378	No
EPA 1630	*Methylmercury in Tissue and Sediment by Cold Vapor Atomic Fluorescence*. August 2007.	Definitive	Methyl mercury	CVAFS	Microbac	No
C-88	*Total Organics in Soil*. Rev 1.0. January 2005.	Definitive	TOC	Carbon Analyzer	DESA	No
Lloyd Kahn	*Determination of TOC in Sediment*. July 1998 and Attachment B, *Supplemental Technical Direction and Additional QC Procedures*				CDM Smith subcontract laboratory TBD	No
ASTM 2005; USEPA 2000	American Aquatic Testing, Inc.: 10-Day static whole sediment bioassay using *Chironomus dilutus*. (Laboratory SOP: GENSED001.1 modified for test conditions outlined in CPG laboratory SOP QA-1407)	Definitive	Toxicity (*Chironomus dilutus)*	Toxicity testing equipment	American Aquatic Testing, Inc	Yes (Refer to footnote 2 on details of SOP modification and logistics for testing)

QAPP Worksheet #23
Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
ASTM 2009; USEPA 2000	American Aquatic Testing, Inc.: 28-Day static whole sediment bioassay using *Hyalella azteca*. (Laboratory SOP: GENSED006.1 modified for test conditions outlined	Definitive	Toxicity (*Hyalella azteca)*	Toxicity testing equipment	American Aquatic Testing, Inc.	Yes (Refer to footnote 2 on details of SOP modification and logistics for testing)

Notes:

The titles above may change dependent on the assigned laboratories.

1: As necessary, the assigned laboratories will perform additional clean-up of split samples (via gel permeation chromatography) prior to analysis of organic compounds.

2: Toxicity Test SOP Modification: At selected locations, CDM Smith oversight staff will request that the CPG field team collect additional sediment mass for laboratory toxicity split sample tests (refer to Worksheet 19 for sample mass requirements). It is anticipated that approximately 3 locations will be sampled. CDM Smith will coordinate with the CPG-assigned laboratory to confirm start times of toxicity tests (refer Worksheet 19 for holding times). CDM Smith will verify that test conditions between the parent toxicity test and split-sample toxicity test (*e.g.*, dissolved oxygen, temperature, or any other test conditions that could impact the sensitivity of the test organisms) are similar. The toxicity tests must meet the performance standards for these tests provided by ASTM (2005 and 2009) and USEPA (2000). Worksheets 12 and 28 define the criteria that will be used to evaluate toxicity test acceptability. The government-assigned laboratory will follow their own laboratory SOPs to perform toxicity testing but modify them according to the CPG-laboratory SOP to ensure comparability on test conditions. Prior to testing, the government-assigned laboratory will thoroughly mix each sample, remove the sediment volume needed for testing, and sieve using the appropriate size mesh to remove large organisms and debris.

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
TOC Analyzer	Per vendor, instrument manual and laboratory SOP	Check daily	Calibration and corrective action as per laboratory SOP and Manufacturer's instruction. No samples shall be analyzed if instrument calibration exceeds the acceptance criteria.		Laboratory analyst / QA officer - TBD	Lloyd Kahn SOP DESA - C-88 Subcontract Laboratory - TBD
HRGC/ HRMS and HRGC/LRMS	Initial Calibration and calibration verification check: Per laboratory SOP	After set up, prior to run and after instrument changes or failures of checks.	% RSD and % recovery per laboratory SOPs.	Check, correct; re-calibrate and rerun all samples analyzed after last valid calibration check	Laboratory analyst / QA officer - TBD	Axys SOP for PAH analysis: MLA-021 EPA Lab SOP for PCB Congeners by CBC01.2 or 1668A - TBD Axys SOP for Chlorinated pesticides by EPA 1613B Mod: MLA-028 Axys SOP for PCDD/ PCDF by EPA 1613B: MSU-020
	Calibration checks: CCVs per laboratory SOP	Daily: Beginning of run and after every 10 samples and at end of analytical run	% recovery per laboratory SOP	Check, correct; re-calibrate and rerun all samples analyzed after last valid cal check	Laboratory analyst / QA officer - TBD	
GC/MS for TCL SVOC - SOM01.2 or SW-846 8270C	Initial calibration: 5 points standards	Upon award of the contract, whenever the laboratory takes corrective action which may change or affect the initial calibration criteria (e.g., ion source cleaning or repair, column replacement, etc.), or if the continuing calibration acceptance criteria have not been met.	relative response factor (RRF) ≥ minimum acceptable RRF listed in Table 5 of procedure; All target compounds, initial relative standard deviation (RSD) ≤ 10% or 20% and correlation coefficient (r)> 0.995. %RSD ≤ value in Table 5 of SOM01.2 or other laboratory SOP as applicable.	Inspect system for problems (e.g., clean ion source, change the column, service the purge and trap device), correct problem, re-calibrate.	EPA CLP Laboratory GC/MS Technician	DESA SOPs: C-89 & C-90 CLP Laboratory - TBD

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
GC/MS	Continuing calibration (CCV)	Once every 12 hours or as per laboratory SOPs	Percent difference (%D) ≤15% or <30% or as per laboratory SOPs	Inspect system; correct problem; recalibrate the instrument, reanalyze affected samples and standards.	EPA CLP Laboratory GC/MS Technician	SOM01.2/8270C
GC/MS	Calibration Standards Verification	Each lot of standards	As per laboratory established control limits	Inspect system; correct problem; re-run standard and affected samples	EPA CLP Laboratory GC/MS Technician	SOM01.2/8270C
GC/MS	Tuning	Daily: every 12 hours	Response factors and RRF as method specified	Inspect system; correct problem; re-run standard and affected samples	EPA CLP Laboratory GC/MS Technician	SOM01.2/8270C
CVAFS	Per method and laboratory SOP	Calibration	Per method/ laboratory SOP. ICAL ≤15%RSD.	Inspect the system, correct problem, re-calibrate, and re-analyze samples.	Assigned laboratory personnel	EPA 1630/1631 Subcontract Laboratory - TBD
		ICV: Check daily when instrument is in use	85-115% R for Total mercury; 80-120 percent recovery (%R) for methyl mercury			
		CCV: Beginning and after every 10 samples	77-123% R for total mercury; 67-133%R for methyl mercury			
ICP-AES and ICP-MS	See ILM05.4; as per instrument manufacturer's recommended procedures	Initial calibration: daily or once every 24 hours and each time the instrument is set up.	ICP-AES: As per instrument manufacturer's recommended procedures, with at least 2 standards.	Inspect the system, correct problem, re-calibrate, and re-analyze samples.	TBD DESA Laboratory, EPA CLP Laboratory or Subcontractor ICP-AES / ICP-MS Technician/ analyst / QA officer	ILM05.4 or SW-846, 6010B/6020 SOPs: DESA Lab: C-109 & C-112 CLP: NA
	Initial calibration	Daily; after tuning and optimizing instrument	r >0.995; minimum of 3 standards and a blank	Repeat analysis; re-prepare calibration standards and reanalyze		

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
	ICV	Before sample analysis	90-110% recovery; source of standard separate from calibration standards	Re-calibrate instrument; prepare fresh ICV standards; do not analyze samples until problem is corrected		
ICP-AES and ICP-MS	Reporting Limit Standard	After initial calibration verification standard	80-120% recovery or concentration ≤ 30% difference (from true value)	Re-analyze failed standard	TBD DESA Laboratory, EPA CLP Laboratory or Subcontractor ICP-AES / ICP-MS Technician/ analyst / QA officer	ILM05.4 or SW-846, 6010B/6020 SOPs: DESA Lab: C-109 & C-112 CLP: NA
	CCV	Every 10 samples and at end of analytical sequence	90-110% recovery; source of standard separate from calibration standards	Re-check; re-calibrate and rerun all samples analyzed after last valid CCV		
ICP-MS	Continuing calibration	Beginning and end of run; 10% frequency or every 2 hours during an analysis run	As per instrument manufacturer's recommended procedures, with at least 2 standards. A minimum of three replicate integrations are required for data acquisition.			

Notes:

1. The analytical laboratory is TBD as per FASTAC and as requested by the USACE and EPA. The general SOP numbers are shown where a specific SOP reference was not available. General GC/MS calibration requirements are presented. Instruments used for analyses follow the calibration frequencies outlined in the method SOP. Laboratory specific calibration information is maintained by the laboratories; method specific calibration information is detailed in the methods.

QAPP Worksheet #28-a
QC Samples Table

Matrix	Sediment
Analytical Group	Toxicity (*Chironomus dilutus)*
Concentration Level	Low
Sampling SOP(s)	See Worksheet #21 – split of CPG samples
Analytical Method/SOP Reference	ASTM 2005; USEPA 2000 (Laboratory SOP: GENSED001.1 modified for test conditions outlined in CPG laboratory SOP QA-1407)
Sampler's Name	TBD
Field Sampling Organization	CDM Smith
Analytical Organization	American Aquatic Testing, Inc.
No. of Sample Locations	See Worksheet #18 & 20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory negative control	1 per test	The LC50[1] for a positive control test should be within the mean LC50 ±2 standard deviations of the control chart.	Notify client. Restart test.	Laboratory Analyst	Health of test organisms	Survival: ≥ 70% Average ash free dry weight: ≥ 0.48 milligram (mg) per surviving individual
Laboratory positive control (Reference toxicant)	1 per test	The LC50[1] for a positive control test should be within the mean LC50 ±2 standard deviations of the control chart.	Notify client.	Laboratory Analyst	Health of test organisms	The LC50 for a positive control test should be within the mean LC50 ±2 standard deviations of the control chart.
Quality of overlying water	See Worksheet 12	Test conditions: Dissolved oxygen ≥ 2.5 mg/L Temperature (daily mean): 23ºC±1ºC Temperature (instantaneous): 23ºC±3ºC Alkalinity, hardness, and ammonia: should not vary by more than 50% during the test	Notify client and determine if restart is required. If not, adjust water quality to ensure values are brought into control.	Laboratory Analyst	Acceptability of test conditions	Dissolved oxygen ≥ 2.5 milligram per liter (mg/L) Temperature (daily mean): 23ºC±1ºC Temperature (instantaneous): 23ºC±3ºC Alkalinity, Hardness, and Ammonia: Should not vary by more than 50% during the test

Notes:

The assigned laboratory also must perform the QA/QC sample analyses and meet all the measurement performance criteria that assess the analytical DQIs as specified in the method or laboratory SOP and or subcontract Statement of work (SOW) as applicable.

1: LC50 (or Lethal Concentration 50) is the concentration of a chemical that kills 50 percent of a sample population.

QAPP Worksheet #28-b
QC Samples Table

Matrix	Sediment
Analytical Group	Toxicity (*Hyalella azteca)*
Concentration Level	Low
Sampling SOP(s)	See Worksheet #21 – split of CPG samples
Analytical Method/SOP Reference	ASTM 2007; USEPA 2000 (Laboratory SOP: ENSED006.1 modified for test conditions outlined in CPG laboratory SOP QA-1467)
Sampler's Name	TBD
Field Sampling Organization	CDM Smith
Analytical Organization	American Aquatic Testing, Inc.
No. of Sample Locations	See Worksheet #18 & 20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory negative control	1 per test	Survival: ≥ 80% Average dry weight: ≥ 0.15 mg per surviving Individual	Notify client. Restart test.	Laboratory Analyst	Health of test organisms	Survival: ≥ 80%
Laboratory positive control (Reference toxicant)	1 per test	The LC50[1] for a positive control test should be within the mean LC50 ±2 standard deviations of the control chart.	Notify client.	Laboratory Analyst	Health of test organisms	The LC50 for a positive control test should be within the mean LC50 ±2 standard deviations of the control chart.
Quality of overlying water	See Worksheet 12	Test conditions: Dissolved oxygen ≥ 2.5 mg/L Temperature (daily mean): 23ºC±1ºC Temperature (instantaneous): 23ºC±3ºC Alkalinity, Hardness, and Ammonia: Should not vary by more than 50% during the test.	Notify client and determine if restart is required. If not, adjust water quality to ensure values are brought into control.	Laboratory Analyst	Acceptability of test conditions	Dissolved oxygen: ≥ 2.5 mg/L Temperature (daily mean): 23ºC±1ºC Temperature (instantaneous): 23ºC±3ºC Alkalinity, Hardness, and Ammonia: Should not vary by more than 50% during the test.

Notes:

The assigned laboratory also must perform the QA/QC sample analyses and meet all the measurement performance criteria that assess the analytical DQIs as specified in the method or laboratory SOP and or subcontract SOW as applicable.

1: LC50 (or Lethal Concentration 50) is the concentration of a chemical that kills 50 percent of a sample population.

Worksheet 30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ ID Numbers	Analytical SOP	Validated Data Package Turnaround Time Laboratory/Data Validation	Laboratory/ Organization (Name and Address, Contact person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact person and Telephone Number)[1]
Sediment	PCB Congeners	Low	TBD	EPA Method 1668A or CBC01.2	65 days (35 days /30 days)[2]	Axys Analytical Services Ltd.	TBD
Sediment	PCDD/PCDF	Low		EPA Method 1613B + DLM02.0/2.1 – Axys SOP MLA-017	65 days (35 days /30 days)[2]	Axys Analytical Services Ltd.	TBD
Sediment	Chlorinated Pesticides	Low		EPA Method 1613B/ Axys SOP MLA-028	65 days (35 days for laboratory analysis/ 30 days for data validation)[2]	Axys Analytical Services Ltd.	TBD
Sediment	Percent Moisture	Medium		SM2540G/ Axys SOP EGN007-07	see above	Axys Analytical Services Ltd.	TBD
Sediment	PAHs and Alkyl PAHs	Low		Axys SOP MLA-021	65 days (35 days /30 days)[2]	Axys Analytical Services Ltd.	TBD
Sediment	TCL SVOC	Low		SW846 Method 8270D Shealy SOP S-SV-021	51 days (21 days / 30 days)	Shealy Environmental Services Inc.	EPA CLP
Sediment	Metals	Low		SW846 Method 6010B/6020	51 days (21 days / 30 days)	Shealy Environmental Services Inc.	EPA CLP
Sediment	Total Mercury /Methyl mercury	Low		EPA Method 1630/1631	51 days (21 days / 30 days)	Microbac	TBD
Sediment	TOC	Low		Lloyd Kahn	51 days (21 days / 30 days)	DESA	CDM Smith Subcontract
Sediment	Toxicity (*Chironomus dilutus)*	Not applicable		ASTM 2005; USEPA 2000. Laboratory SOP: GENSED001.1 modified for test conditions outlined in CPG laboratory SOP QA-1407	90 days (60 days for toxicity test plus 30 days for data validation)[2]	American Aquatic Testing, Inc.	TBD
Sediment	Toxicity (*Hyalella azteca)*	Not applicable		ASTM 2009; USEPA 2000. Laboratory SOP: GENSED006.1 modified for test conditions outlined in CPG laboratory SOP QA-1467	90 days (60 days for toxicity test plus 30 days for data validation)[2]	American Aquatic Testing, Inc.	TBD

Notes:

1: Subcontract laboratories will communicate with the ASC on split sample status and potential analytical difficulties (if any arise). With the approval of the ASC and Task Leader, the turn-around-time for the laboratory data package deliverable can be adjusted to account for re-analysis or additional quality control as necessary.

2: Toxicity testing data will not require full data validation. Toxicity data will only be reviewed against the acceptance limits provided in Worksheets 12 and 28.

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria[1, 2]	Data Validator (title and organizational affiliation)
IIa /IIb	Sediment	Chlorinated Pesticides –EPA 1613B Modified	Low-trace	Region 2 - National Functional Guidelines	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		PCB Congeners – CBC01.2 or EPA 1668A	Low	Region 2 - Data Validation Guidelines SOP HW-46, rev 0 or National Functional Guidelines	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		PCDD/PCDF Congeners – EPA 1613B	Low	EPA SOP HW-19 or 25, Validating PCDD/PCDF by HRGC/HRMS, Revision 1 or National Functional Guidelines	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		PAH/Alkyl PAH – Axys Laboratory SOP	Low-trace	National Functional Guidelines	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		SVOCs - SOM01.2 Modified or 8270C	Low	Region 2 – Data Validation Guidelines SOP HW-35, rev 1 or National Functional Guidelines	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		Metals - 6010B/6020 or ILM05.4	Low/Medium	Region 2 - Data Validation Guidelines SOP HW-2, rev 13 or National Functional Guidelines	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		Methyl mercury - EPA 1630	Trace	National Functional Guidelines modified by QAPP Worksheets #12,15,19 and 24	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		Total Mercury - EPA 1631	Trace	National Functional Guidelines modified by QAPP Worksheets 12,15,,19 and 24	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		TOC - Lloyd Kahn	Low	DESA validation SOP or CDM Smith 029A SOP modified by QAPP Worksheets #12,15,,19 and 24	DESA or CDM Smith ASC, Scott Kirchner or designee

Notes:

1. Results will be validated if analyzed by a subcontract laboratory by the process of data verification and assessment utilizing the laboratory QC summaries.
2. All validation procedures will utilize the measurement performance criteria in the QAPP and any additional method requirements.

QAPP Worksheet #37

Usability Assessment

An Oversight Summary Report and Data Quality Summary Report will be prepared by CDM Smith personnel. Frank Tsang, Project Manager, will be responsible for its content and for assigning this task to CDM Smith personnel. The data comparability review and usability assessment will be conducted on validated data. The effectiveness of control actions will be evaluated during the laboratory review of the data, data validation and data evaluation and data quality assessment process. Data information will be documented in the laboratory narrative, data validation report and in the Data Comparability Report. The report will include an overall assessment of the CPG's analytical data using the results of the split sampling and field oversight including the field oversight observations of deficiencies and compliance; and an assessment of the split sampling data quality. The following items will be assessed for CDM Smith split samples and conclusions drawn based on their results:

Precision – Results of laboratory duplicates will be assessed during data validation and data will be qualified according to the data validation procedures cited on Worksheet #36. Split samples will be compared by matrix using the relative percent difference (RPD) for each pair of results reported above quantitation limits (QL) or for organic and inorganic analyses respectively. RPD acceptance criteria of less than or equal those listed in this QAPP will be used to access sampling precision. Absolute difference will be used when one or both results are at or below the QL. An absolute difference of less than five times the QL will be the acceptance criteria. A discussion summarizing the results of laboratory precision and any limitations on the use of the data will be described in the report.

Accuracy/Bias Contamination – Results for all laboratory blanks will be assessed as part of the data validation. During the validation process, the validator will qualify the data following the procedures described on Worksheet #36. A discussion summarizing the results of laboratory accuracy and bias based on contamination will be presented and any limitations on the use of the data will be described in the report.

Representativeness – A review of adherence to field procedures will be performed in order to assess the representativeness of the sampling program. Data validation narratives will also be reviewed, and any conclusions about the representativeness of the data set will be discussed.

Comparability –The results of this oversight will be used in conjunction with the CPG's data to support the investigation results. The data will be handled, analyzed and reported in a manner that is comparable to the CPG's data set. The RPD between CDM Smith's and the CPG's data will be calculated.

Completeness – A completeness check will be performed on the split sample data generated by the laboratories. Completeness will be determined based on whether all CPG planned (or modified) sampling locations were sampled at the pre-determined frequencies and the obtained data set compared to the project completeness goal of 90 percent. A discussion summarizing the results of project completeness and any limitations on the use of the data will be described in the report.

For sampling, completeness will be calculated as the number of samples collected and analyzed divided by the number of planned for collection. For each analyte, completeness will also be calculated as the number of data points that meet measurement performance criteria divided by the total number of data points for that analyte. A discussion summarizing the results of project completeness and any limitations on the use of the data will be described in the report.

QAPP Worksheet #37

Usability Assessment

The results will be presented in text of the Data Comparability Report. Data gaps will be evaluated if requested by USACE/EPA. The report will discuss the completeness of the planned and collected data and the affect on the data objective of evaluating the accuracy of the CPG's data.

Sensitivity – Data results will be compared to project action limits provided on Worksheet #15. A discussion summarizing any conclusions about sensitivity of the analyses will be presented, and any limitations on the use of the data will be described in the report.

Reconciliation – The PQLGs presented in Worksheet #12 will be examined to determine if the objectives were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of major impacts observed from data validation, data quality indicators and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the PQLG was met and whether project goals were achieved. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

The following equations will be used:

1. To calculate split sample precision: $RPD = 100 * 2 |X1 - X2| / (X1 + X2)$

where X1 and X2 are the reported concentrations for each duplicate or replicate

2. To calculate split data completeness:

% Completeness = V/n * 100 - where V= number of measurements judged valid; n = total number of measurements made and

% Completeness = C/x * 100 - where C= number of samples collected; x = total number of measurements planned

The investigation results will be presented in tables and figures and in the text of the Data Comparability Report. Data gaps will be evaluated if requested by USACE/EPA. The report will discuss the completeness of the planned and collected data and the affect on the data objective of evaluating the accuracy of the CPG's data.

References:

CDM Smith. 2010. *Final Quality Assurance Project Plan Physical Water Column Monitoring and Generic Information for Upcoming Tasks*. March.

Malcolm Pirnie, Inc. 2009. *Lower Passaic River Restoration Project. Quality Assurance Project Plan. Biological Sampling Community Surveys, and Toxicity and Bioaccumulation Testing. Version 01*. August 6.

Windward Environmental. 2009. *Lower Passaic River Restoration Project. Quality Assurance Project Plan. Final Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing*. Revision 0. October 8.

Windward Environmental. 2012. *Lower Passaic River Restoration Project. Quality Assurance Project Plan*. Draft Surface Sediment Chemical Analyses and Benthic Invertebrate Toxicity and Bioaccumulation Testing". Addendum [5] to the QAPP. October 8.